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Chaotic Worlds: An Analysis of World of Warcraft

Brad McKenna
The University of Auckland, brad.mckenna@port.ac.uk

Lesley A. Gardner
The University of Auckland, l.gardner@auckland.ac.nz

Michael D. Myers
The University of Auckland, m.myers@auckland.ac.nz

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Brad McKenna
The University of Auckland
brad.mckenna@auckland.ac.nz

Lesley A. Gardner
The University of Auckland
l.gardner@auckland.ac.nz

Michael D. Myers
The University of Auckland
m.myers.auckland.ac.nz

ABSTRACT

Virtual worlds provide new forms of collaboration and social interaction. The World of Warcraft (WoW) is one such virtual world. It is the most popular example of what is called a Massively Multiplayer Online Role Playing Game (MMORPG). In this paper, we analyze players' outcomes with WoW using chaos theory. Our paper suggests that players are highly sensitive to initial conditions which are impacted by style of play and the social structure of groups.

Keywords

Virtual Worlds, Chaos Theory, World of Warcraft, MMORPGs.

INTRODUCTION

Virtual worlds, where millions of people can interact with each other via graphical three-dimensional representations of a user (called avatars), (Shen and Eder, 2009), are becoming a new area of interest for information systems scholars. Virtual worlds provide collaboration mechanisms to overcome geographic barriers (Davis, Murphy, Owens, Khazanchi, and Zigurs, 2009). Virtual worlds such as Second Life have implications for business, education, social sciences, and society as a whole (Messinger et al., 2009).

One budding stream of IS research into virtual worlds is focusing on virtuality in organizations (D'Eredita and Nilan, 2007; Heckman, Crowston, and Misiolek, 2007). Another stream is focusing on virtuality in online games (Davidson and Goldberg, 2009; Davis et al., 2009; Messinger et al., 2009; B. A. Nardi, Ly, and Harris, 2007; Schultze and Rennecker, 2007). Our paper contributes to this latter stream.

Massively Multiplayer Online Role Playing Games (MMORPGs) are particularly interesting as a new kind of social phenomenon. Games such as WoW offer alternative worlds where social functions, learning, and the development of social skills can be practiced in a virtual environment (Davidson and Goldberg, 2009). Until recently, very few IS scholars have examined MMORPGs.

In this paper we analyze one MMORPG, namely WoW, from the perspective of chaos theory. Chaos theory has been used in organizational studies (Beinhocker, 1997; Fitzgerald, 2002; Kellert, 1993; Lissack, 1997) and to a limited extent in IS (McBride, 2005). This paper aims to explore player experiences in WoW. We apply chaos theory which may be able to assist in the understanding of MMORPG environments. Our findings suggest that it is chaos which makes MMORPGs fun and enjoyable for players, and hence, contributes to the ongoing popularity of the game.

WORLD OF WARCRAFT

World of Warcraft is the most popular MMORPG with over 11 million players globally. A player in WoW assumes the role of a hero as they explore this virtual world. Given the nature of the game as explained below, there are opportunities for social and strategic interactions. Players can interact with thousands of other players in the same world to adventure together or fight against each other. Players can form friendships, create alliances, and compete against enemies (Blizzard, 2010). In this light, players have fun while achieving the objectives of the game.

WoW provides a system where players group together into guilds. Guilds consist of several players with similar interests within one of the two in-game factions (Alliance or Horde), and provide opportunities for assistance with quests, social interactions, and protection from rival factions. Hardcore players often employ behaviour that suggests tribalism. The majority of players join guilds because they enjoy the feelings of group unity, cooperation, friendship, and accomplishment.

It is common for players to promote unity and argue against fighting within guilds so as to unite and successfully fight a rival faction (Brignall and VanValey, 2007)

A popular activity for players in WoW is raiding. This involves a large number of players cooperating together, often for hours at a time (Bardzell, Bardzell, Pace, and Reed, 2008). This involves high levels of collaboration among all players, where one's survival depends on it. Using a combination of ethnographic observation, interviews, chat and video analysis, Bardzell et al. (2008) examined the conditions which produce the most effective collaborations in a raid. Raids involve encounters with mobs (enemies) that can often be chaotic. In order to avoid this, the authors suggest that players should try to distribute the threat of mobs across the members of the group.

Aarseth (2008) investigated the notion that Azeroth (the world within Warcraft) is a crafted, fictional world, and questioned its worldliness. Blizzard Entertainment has put in a lot of effort to make Azeroth a rich platform for play experience to give players the impression of a continuous landscape consisting of challenging tasks, sights and beings. Azeroth is a pre-programmed landscape and once a mob has been killed by a player, it is revived by the system minutes later, ready for the next player.

Klaztrup (2008) argues that understanding death is an important aspect to understanding the complexity of WoW. Every player will experience death many times during their adventures in the game world. Death in WoW does not mean the end of the character. After a short time the character will be resurrected and can continue playing in the world. Designers of WoW hold the perspective that death in the game is seen as a way to teach players to handle the aspect of the game in a more successful way.

Rettberg (2008) investigated questing in WoW. Quests are tasks in the game which players are asked to perform. Every quest has a clear structure. The quest starts with a quest giver who provides a background, gives some objectives, and offers a reward for successful completion. Rettberg (2008) argues that this clear structure means that certain patterns emerge during the course of questing.

All games have rules, and WoW is no exception. Rules are made by the designers of WoW and are supposed to be followed by players. Schultze and Rennecker (2007) describe WoW as a fantasy game with a progressive rule structure where social norms develop around designer intended rules. However, there are various ways in which players can break the rules (Mortensen, 2008). Some examples of this are gold farming, where players illegally pay "sweatshops" of players (often from China) to earn them in-game items or gold, or "bot-fighting," where characters are not controlled by the player, but by a program the player has installed. Both of these examples are illegal in WoW.

There are a number of studies which have looked into the social interactions that exist in WoW. Sherlock (2007) investigated how grouping is mediated and the expectations players put in place when they participate in groups. Chen et al. (2008) looked at how game feature changes such as patches affect the social interactions which exist in WoW. Nardi and Harris (2006), investigated how different kinds of social interactions, from brief informal encounters to highly organized play in structured groups, affect players enjoyment. Nardi et al. (2007) examined how players learn the game through chat conversations with players to devise tactics and strategies for game play. Chen and Duh (2007) attempted to understand the social interactions that exist between players and developed a broad framework to better understand these interactions.

CHAOS THEORY

Chaos theory was selected for this paper because we believe it can help understand how play experiences differ over time, and from player to player. Chaos Theory originated in mathematics and can be defined as 'the qualitative study of unstable aperiodic behavior in deterministic non-linear dynamical systems' (Kellert, 1993). Chaos involves the study of phenomena exhibiting a sensitive dependence on initial conditions. Therefore, if any parameter in a system is slightly changed, very different results can occur (Pickover, 1994). Chaos can also be thought of as how something changes over time (Williams, 1997).

The existence of chaotic systems is now well established in mathematics, ecology, meteorology and similar non-social science fields (Gregersen and Sailer, 1993). In their paper, Gregersen and Sailer (1993) argue that some social behaviour is unpredictable and hence inherently chaotic. Existing social entities, such as groups, institutions, or organizations with identical initial states and identical environments, may exhibit completely different behaviors even though their behavior is governed by the exact same set of rules or laws.

There are a few examples of chaos theory used in information systems. Dhillon and Ward (2002) used chaos theory to discover patterns in complex quantitative and qualitative evidence for the nature of information systems. McBride (2005) reviewed organizational literature relating to chaos theory and formulated a number of key concepts which should be incorporated into an interpretive framework for the analysis of chaotic systems. These concepts are described in Table 1.

Domain of Interaction	Systems can be defined by a bounded space, which encompasses all possible states that a system could be in.
Initial Conditions	The set of initial states for the information system at the start of a period of change.
Strange Attractors	Patterns of behavior that information systems and actors can exhibit over time.
Outcome Basin	A subset of possible bahaviors within the domain of interaction, within which the strange attractor iterates.
Events and Choices	During an information systems life cycle, events occur and choices are made which can significantly influence the role in the organization.
Edge of Chaos	A system may be in a stable state until internal or external events and choices made by participants drive the system towards a critical point where dramatic change results
Bifurcation	A change in behavior of a dynamic system. This change may trigger the system to 'topple' over the edge of chaos.
Iteration	A cycle of repeating behavior of a strange attractor. Aperiodic cycles of interaction amplify initial conditions which contributes to the evolution of the system.
Connectivity	Knowledge flow which exists because of the interactions between actors, either human or machine.

Table 1: Chaos theory concepts by McBride (2005)

METHODOLOGY

The study used a qualitative research method called netnography, which is a form of ethnography used to study online communities (Kozinets, 2010; Myers, 2009). The collection of data in netnographic studies usually involves participant observation and interaction with community members (Myers, 2009).

One of the researchers began playing WoW for a few hours per day. The researcher completed a large number of quests and a couple of raids with multiple characters. Extensive field notes were recorded during play time. This involved screen captures (WoW provides the ability to record the game in movie files) and note taking. At the time of writing, the researcher had obtained one level 55 character, and one level 64 character and a number of lower level characters. Both high level characters were members of guilds. The researcher also spent considerable time reading and researching WoW through wowwiki.com and thottbot.com and gaining experience through YouTube clips of raids to assist understanding of complex raids scenarios (Youtube.com, 2008). Considerable time was also spent discussing play tactics with other WoW players. The field work lasted for six months. The total play time for this study was 330 hours.

CHAOTIC WORLDS

This section applies the framework of McBride (2005) to an analysis of the chaotic nature of WoW using two examples: questing and raids. The first example, questing, will show how chaos theory (see Table 1 above) can apply to solo players in WoW. The second example, raiding, is where multiple players must interact together in order to achieve a common goal.

Questing

Questing is one of the first things a new player will do as they enter WoW. If the player right clicks on a quest-giver, a player may then choose to accept or decline the quest (Figure 1). A quest usually involves a series of activities. Upon completion of the quest, the player is rewarded with experience points, money, an item, or any combination of these. Once enough experience points have been collected by a player, they can proceed to the next level. Levelling is one of the most important aspects of WoW, as each increase in level provides the player with more strength or magic abilities which enable the player to kill higher level mobs.

We can define our **initial conditions** as follows. A quest will begin with a brief story and a request for help, along with the rewards which will be offered for the successful completion of the quest. Players may only undertake a quest if they have not

already successfully completed it and they have achieved the appropriate level to play. If a quest was accepted, the player must travel to the location required to fulfil the objectives of the quest. Initial conditions could differ for separate characters starting the same quest. One could be 20% through level 10, while another could be at 90%. The lower level character therefore has a higher incentive to kill more mobs to reach the next level (killing mobs earns experience points). Therefore one player may choose a different game tactic than the other player.

The **domain of interaction** for any quest is the location of the event within WoW. These locations are often filled with unfriendly mobs who will try to kill our character.

Players can exhibit different patterns of behaviour: one player may be more cautious, attacking only one mob at a time; another player may be more aggressive, preferring to attack multiple mobs simultaneously. Players also have the option of using a Player vs. Environment (PvE) server, or a Player vs. Player (PvP) server. If a player is using PvP, then at any time, a player from the opposing faction could attack that player. In a PvP scenario not only do players have the chance to be attacked by mobs, but they also may be attacked by other players. In a PvE scenario, other players cannot attack our player unless we allow it. Each of these styles are our **strange attractors**, potentially altering the experience the player has. The **outcome basin** would depend on if the player is using a PvE or PvP server.

Figure 1: Quest-giver and brief story explaining the details of the quest.
Source: ©2004 Blizzard Entertainment, Inc. All rights reserved

Events and choices impact the initial conditions. If, for example, a player is trying to attain a level quickly, they may spend more time killing mobs in order to earn more experience points. A low level character may also decide to proceed more carefully than a higher level character. This may give positive feedback to the player starting the next quest.

Depending on the events and choices the player makes, the system could arrive at different states. The **edge of chaos** could be reached if a player decides to run into the location, which is in a stable state, annoying all the mobs inside. The system would then shift to a state (**bifurcation**), where all mobs are focused on the character. If he is skilled enough, the player may be able to kill all the mobs, and thus earning more experience points than a player who takes a more cautious approach.

Throughout game-play in WoW, aperiodic cycles of questing contribute to the evolution of the player's character. Each quest the player completes results in experience points for the quest and extra for killing mobs. Therefore the total number of experience points (Et), earned during a quest is calculated by the sum of the total experience points earned while killing mobs (Ek), plus the reward points (Er). This can be illustrated in the following formula: $Et = \sum Ek + Er$. Therefore, these **iterations** of behavior create positive feedback which creates different initial conditions for different players starting the next quest.

There are different levels of **connectivity** which appear during play: the connection between players (social) and the connection between the player and the virtual world itself (software).

Raids

Raids are groups of players who group together to fight powerful monsters or to engage in player vs. player combat. Raids allow players to enter the most dangerous areas of WoW and overcome its challenges (Blizzard, 2010). Players are no longer acting alone, but are part of a larger group, which creates strong social ties between players. Therefore it is essential to be a good team player in order for the group to complete the objectives of the raid.

A raid group is formed by inviting others to join in the adventure. These players could be members of your guild or new players. Each group has their own group chat which is only viewable by members of that group. The location of each group member is shown on the map.

A raid leader is in charge of raid organization, structure, and communication. The leader can move people between groups and add or remove raid members. Leaders also have the ability to promote other players to help them to manage the raid based on their abilities. During the planning of the raid, the leader will mark targets with symbols which indicate the order of attack. All players in the raid will be able to see these symbols and are used to coordinate the attack.

The **domain of interaction** is the particular raid instance. In WoW, there are a large number of raids which groups could undertake, each with different objectives and requirements. For example, some raids are designed for 20 players, while others are for 40 players. The domain of interaction will also include the environmental features of the world, as well as the mobs the group will meet.

The **initial conditions** for a raid group can change. A particular raid senario may be repeated multiple times with different player membership. Each instance may differ. The initial conditions are also sensitive to the rules of the game. As software patches become available, rules within the game may change.

The **strange attractors** may change with each raid instance as well. Different groups of players completing the same raid instance could exhibit different patterns of behavior. Prior experience may alter a group's behavior so as to have a more favourable outcome from the raid. Patterns of behavior could also be different between different raids for the same group. Therefore, the **outcome basin** is the pattern of behaviour which could be exhibited over raid instances. This could also apply to different raid leaders coordinating the same raid over different times as each exhibits different characteristics.

The **events and choices** that a raid group make will greatly impact the outcome of the raid. Poor choices could negatively impact the group. If a group was to attempt the raid at another time, they would be able to draw on previous experience. This would therefore change the initial conditions as the second raid would be attempted with the benefit of hindsight.

The **edge of chaos** in a raid is recognised from the different variables which make up a raiding group. Raid groups have different players, with different skills and abilities. As a raid group enters the domain of interaction, players begin interacting with the environment. The system transforms from a stable state where all mobs were standing idle, to a state where mobs are attacking players. Depending on the variables, the outcomes may differ from a poorly managed group where all members die to a well managed group where many survive. **Bifurcation** will occur as the state of the environment changes in response to the variables in the raiding group, i.e. all raid group members could die, or all mobs could die and the raid group "wins".

Iteration will occur in a raid group as groups perform the patterns of behaviour in order to attack mobs during the raid. Members exhibit different behaviour traits, for example, a member known as the tank is used to "agro" the mob and another is a healer to keep other players alive. Such patterns of behaviour are repeated for each mob that the group attacks.

Connectivity in a raid exists in the group that is undertaking the raid. A raid must have strong social ties and good coordination in order to successfully complete the raid.

DISCUSSION

Chaos theory provides a framework whereby researchers can understand a phenomena and how it changes over time. Chaos involves the study of phenomena exhibiting a sensitive dependence on initial conditions. Therefore, if any parameter in a system is slightly changed, very different results can occur (Pickover, 1994). Chaos theory is the 'study of unstable aperiodic behavior in deterministic non-linear dynamical systems' (Kellert, 1993).

We found that there are chaotic elements in WoW. Aperiodic behaviour in WoW can be demonstrated by the large number of activities a player can perform. As well as questing and raiding, players may concentrate on enhancing their characters professions, exploring the world, or socialising with other players. Many activities performed in WoW are aperiodic, where players perform tasks on an irregular basis.

Behaviors in chaotic systems are often perceived as unpredictable (Gregersen and Sailer, 1993). Non-linear dynamic systems are those that do not clearly follow predictable and repeatable pathways over time (Dhillon and Ward, 2002; McBride, 2005; Williams, 1997). McBride (2005) suggests that this chaotic behavior is not an indication of disorder, but rather indicates that behavior is difficult to define. Although quests in WoW have a predefined repeating nature (Rettberg, 2008), their chaotic nature is exhibited by the multitude of pathways a player can take to complete a quest. Quests have set rewards, however the total amount of experience points a player receives after quest completion is determined by play-style and differs between players. Play style is not something that can be determined by WoW programmers. Raids also offer non-linear pathways toward chaos as the behavior of the raiding group is entirely dependent on the social structure within the group. As Gregersen and Sailer (1993) point out, social structures are inherently chaotic. Initial conditions impacting a raiding group could also be changed with players installing modifications to the user interface, such as those presented by Taylor (2008).

Hence, despite the rules of the game and pre-programmed nature of WoW, the element of chaos is introduced into WoW by the addition of players interacting with the world. In chaos theory, two objects with the same initial conditions within the same environment can exhibit completely different behaviors, even though their behavior is governed by the same set of rules (Gregersen and Sailer, 1993). Therefore, two players completing the same activity on different servers (players on different servers cannot interact) may have completely different experiences.

Dying is an important aspect of WoW. Any character venturing out on a quest or a raid has a chance of dying (Klaztrup, 2008). Chaotic systems can be described by their current state (McBride 2005), and two important states in WoW are the state of the character, "alive" or "dead." Bifurcation will occur depending on the state of the character. If a character is dead, they will move around the world as a ghost. Ghosts have limited functions, and until the ghost returns to the location the character died, the player cannot continue normal game functions. Bifurcation will then occur again once the character is returned to life. Although death in WoW is not permanent, it is not something that any player wants to happen. However, the developers of WoW believe that dying in a game is useful for teaching players to handle the aspects of the game and to learn from past mistakes (Blizzard, 2010). Therefore, dying has a positive feedback response to the initial conditions for a player.

CONCLUSION

This paper has suggested that chaos theory can be applied to a virtual world such as of WoW. Although WoW has rules and is defined by the limits of its programming, the introduction of human players into the game extends the limits of the game and introduces a range of play experiences. Social behaviour is often hard to predict and hence virtual worlds such as WoW may be inherently chaotic.

Interactions in WoW take many forms, from a solo player completing a quest and interacting with the environment, to raids where players must cooperate together. We believe that these interactions are inherently chaotic, in the sense that the game experience is significantly different from player to player. Game scenarios vary depending upon play style and how groups are coordinated. Every player who logs into WoW is likely to experience the game differently from any other player and ultimately arrive at different outcomes.

Of course, we recognise that our study is only a preliminary effort aimed at understanding virtual worlds and MMORPGs. Further research is needed to see if chaos theory can be applied to other MMORPGs besides WoW.

We conclude this paper by emphasising that we do not consider chaos to be a negative aspect of virtual worlds. In fact, it is chaos which makes MMORPGs fun and enjoyable for players. Slight changes in initial conditions for a character ensure that every time the game is played, the possible end points can be vastly different. We suggest that this may have contributed to the success of WoW. The practical implications of this paper is that it suggests developers of MMORPGs should ensure games remain fun and interesting by ensuring that game experience differs between players and characters each time the game is played.

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